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SECTION C: ASTI SPACE SEGMENT REQUIREMENTS

C.1 SCOPE OF WORK

C.1.1 Introduction

This Statement of Work (SOW) sets forth the requirements to provide space segment (e.g. transponders) for the Alaskan Satellite Telecommunications Infrastructure (ASTI), formerly Alaskan National Airspace System (NAS) Interfacility Communications System (ANICS). The ASTI program provides interfacility communications to primarily support the FAA Air Traffic Control (ATC) mission between remote and hub facilities located in Alaska; with additional remote locations in Auburn (ZSE) WA, Oklahoma City (OKC) OK, and Anadyr (DYR) Russia.

C.1.2 Background

ASTI is an FAA-owned and operated satellite based network that provides Alaska with interfacility communications for critical, essential, and routine air traffic control services (Availability of 0.9999, 0.999, and 0.99). The ASTI network topology consists of four hub earth stations, 60 remote earth stations, leased transponder space segment, and a Network Operations Control Center (NOCC). ASTI uses two satellites, denoted primary and alternate, each providing simultaneous full period service to meet network architecture design requirements for reliability, performance, economy, maintainability, flexibility and system capacity

The four ASTI hub earth stations are located at the Fairbanks, Kenai, and Juneau Automated Flight Service Stations (AFSS) and the Anchorage (ZAN) Air Route Traffic Control Center (ARTCC). The 60 ASTI remote earth station facilities are deployed at various locations throughout Alaska and one at the ARTCC in Seattle. In general, a remote earth station facility has four satellite modems providing four full period satellite links. The first link is to ZAN via the primary satellite, the second is to the AFSS hub via the primary satellite, the third is to ZAN via the alternate satellite, and the forth is to the AFSS hub via the alternate satellite. There are exceptions where a remote uses one satellite or only connects to ZAN. The NOCC is located at the ZAN ARTCC and using a Network Monitor and Control System (NMCS) controls the remotes via links from ZAN or through the associated AFSS hub and its links to the remote. As required, the NOCC can use NMCS connectivity through the multiple links to remote sites to change configuration parameters (e.g. sat modem frequency, modulation, data rate, etc) as well as re-point or peak up antenna position. Within the FAA, Second level engineering support is provided from offices in Anchorage and Oklahoma City. A fully functioning remote facility used for testing and training (TTF) is located in the ZAN facility and a laboratory with remote and hub equipment located at the Mike Monroney Aeronautical Center (MMAC) in Oklahoma City.

C.1.3 Program Objectives

The primary objective of the ASTI program is to provide highly reliable interfacility communications to support en route, terminal, and flight service air traffic control operations. The ASTI program provides the backbone system needed in Alaska to support existing and future NAS telecommunications

requirements. One future objective is to provide Ku Band VSAT connectivity to single antenna, single link locations in Alaska.

C.1.4 Scope of Work

The requirements contained herein provide a description of the transponder service and associated support services necessary to provide space segment for the ASTI network. The required transponder services include: C-band transponder allocation on two satellites. The required support services include Program Management, Engineering, and FAA maintenance support.

The existing ASTI facilities are listed in *Appendix A.*

C.2 APPLICABLE DOCUMENTS

The following specification, handbooks, orders, and standards, form a part of the requirements contained herein and are applicable to the extent specified. The latest version of these documents as of the contract date will apply. In the event of conflict between the requirements and any of the applicable documents cited below, the provisions of the requirements take precident.

Table 2-1. Applicable Documents

Document Number	Title
CFR Title 47 Part 25	Title 47, Telecommunications, Vol. 2, Chapter I – Federal Communications Commission, Part 25, Satellite Communications
FAA Order 1600.1E	Personnel Security Program
FAA Order 1600.72A	Contractor and Industrial Security Program
FAA Order 1600.73	Contractor and Industrial Security Program Operating Procedures
FAA Order 6000.201, Change 1	Maintenance of Alaskan Satellite Telecommunications Infrastructure (ASTI) Equipment
	Non-Government Documents
EIA-411-A	Electrical and Mechanical Characteristics of Earth Station Antennas for Satellite Communications

Documents can be obtained from:

FAA Orders: http://www.faa.gov/regulations_policies/orders_notices/index.cfm

FCC Documents: Federal Communications Commission (FCC)
445 12th Street, SW
Washington, DC 20554
Telephone Number: 1-888-225-5322

EIA Documents: Electronic Industries Association
2001 Eye Street, N.W.
Washington, DC 20006

Copies of all other specifications, drawings, and publications required in connection with specified procurement functions should be obtained by writing directly to the source.

C.3 GOVERNMENT FURNISHED ITEMS

C.3.1 Documentation

The Government will provide current operational frequency plans and link budgets. The Government will provide frequency plans or link budgets generated using Optimal Satcom COMPLAN. This information will be provided in COMPLAN file format, or MS Excel formatted reports generated by COMPLAN. The information will be the best available during the time of delivery. The Contractor must verify the accuracy of all information.

C.3.2 Telephone Access

The Government will provide access to existing Government telephones for use by the Contractor personnel while working on an FAA/Government facility for the conduct of ASTI related activities.

C.4 GOVERNMENT RESPONSIBILITIES

C.4.1 Link Turn-up

The Government will perform turn-up of links in coordination with the Contractor. The Government will specify dates and times of link turn-up and coordinate transition support requirements with the Contractor.

C.4.2 Frequency plans

The Government will engineer all changes to frequency plans. These changes include, but are not limited to:

- Frequency of a carrier within, or movement between, transponders on a satellite
- Modulation or FEC for a carrier
- Data rate for a carrier
- Use of Carrier in Carrier or Paired Carrier technology

C.4.3 Government Escort

FAA employees will escort Contractor employees during any and all access to FAA facilities and oversee access to FAA space segment data. Contractor's employees do not require unescorted access or continuing access over 180 days to FAA sites and/or space segment data, as defined in FAA Order 1600.72A.

C.5 REQUIREMENTS

C.5.1 Contractor Requirements

The Contractor must provide C-Band space segment bandwidth starting at 1.5 transponders per satellite with the ability to add bandwidth in one-quarter transponder increments. The Contractor must have the ability to optionally provide Ku-band space segment bandwidth from a single transponder with the ability to add bandwidth. The Contractor must provide satellite transponder space required by the government during the life of the contract.

C.5.1.1 Documentation

The Contractor must provide all satellite information including, but not limited to, orbital position, coverage map, saturated flux density (SFD), effective isotropic radiated power (EIRP), transmit power available at the satellite, figure of merit (G/T), high power amplifier back-off, satellite antenna gain, polarity and frequency of beacons, and any other information required for the Government to calculate link budgets and center of box.

The Contractor must provide ephemeris information from the satellite operator that allows the orbital location of the satellite to be computed for verification of position and calculation of center of box windows for antenna alignments.

C.5.1.2 Satellite Space Segment Plan

The Contractor must provide a Satellite Space Segment Plan. The Satellite Space Segment Plan must include the following at minimum:

- A description of the satellite(s) by vendor and name to include launch date and service life of the satellites.
- If the Contractor leases space segment for resale to the Government, a description of the Satellite Space Segment Lease Plan between the Contractor and satellite vendor detailing the satellite spectrum assignment, satellite cycle/life span, proposed contract lengths and options, and satellite related trouble reporting procedures must be provided to the FAA Authorized Government Representative (AGR).
- The method the Contractor will use to monitor the satellite link(s) and the satellite(s) for satellite related problems, (e.g. transponder saturation or interference from other carriers).

C.5.1.3 Technical Support

The Contractor must provide assistance to Government personnel and other service providers when troubleshooting is required to determine the location of a service problem. The Contractor must provide a telephone number for trouble reporting and trouble resolution assistance. This service must be live Contractor assistance available 24 hours per day, 7 days per week.

The Contractor must have only one point of contact for restoration service.

The Contractor must provide an escalation plan and procedures that include points of contact and telephone numbers. The plan must include successively senior management personnel to enable the execution of the escalation procedures.

The Contractor must keep the FAA advised of the progress being made in restoring system performance by calling the appropriate FAA point of contact at the intervals requested.

The Contractor must support FAA maintenance requirements to verify the alignment and cross-polarization of the antennas on a periodic (e.g. yearly or following antenna repair) for antenna alignment verification per FAA Order 6000.201.

C.5.1.4 Restoral

If the satellite service on any transponder provided for ASTI fails, the Contractor must restore complete service at the highest priority provided by the Contractor on an operational transponder that has been defined as the restoral transponder(s).

The Contractor must define the restoral transponder(s) and restoral satellites upon contract award so that frequency information and pointing information can be programmed into the ASTI equipment.

The Contractor must update restoral process information yearly upon contract renewal and as changes to the restoral process occur.

Failure of a transponder or fractional transponder providing service to the FAA that does not have a backup transponder on the same satellite, and requires movement of the FAA traffic to a backup satellite, requires all FAA traffic to be moved to the backup satellite.

The Contractor must provide a Restoral Plan for failure of any of the ASTI transponders. The Plan must describe restoral for transponder outage, satellite outage, and any other outages that may occur.

C.5.1.5 Personnel Security

The Contractor and subcontract personnel must comply with the personnel security requirements as specified in FAA Order 1600.1E, Personnel Security Program, FAA Order 1600.72A Contractor and Industrial Security Program and FAA Order 1600.73 Contractor and Industrial Security Program Operating Procedures.

C.5.2 Space Segment Technical Requirements:

C.5.2.1 Transponder bandwidth must be provided on two satellites (referred to as Primary and Alternate herein).

C.5.2.2 There must be a minimum of 4 degrees spacing in geostationary orbit between the Primary and Alternate satellites to eliminate the effects of sun outage overlap between the two satellites and Radio Frequency Interference (RFI).

C.5.2.3 Satellites must have industry standard station keeping limits of +/-0.05 deg E and +/- 0.05 deg N.

C.5.2.4 C Band satellites must have the required signal strength to serve all of the State of Alaska; Seattle/Auburn, Washington; Oklahoma City, Oklahoma, and Anadyr Russia. Satellites must provide C-Band transponders.

C.5.2.5 Ku Band satellites used for new services must have the required signal strength to provide coverage for the entire state of Alaska.

C.5.2.5.1 Satellites providing Ku Band service are not required to reside on the same satellites providing C Band service.

C.5.2.6 C Band transponders provided on a satellite, backup transponders on that satellite, and the associated backup satellite, (e.g. primary and primary backup or alternate and alternate backup) must have the same polarity. Polarity may be either vertical or horizontal.

C.5.2.6.1 Transponder failures that require a change of transponder or satellite to restore service must not require a change of polarity by the ASTI antennas.

C.5.2.6.2 Circular polarity must not be used.

C.5.2.7 Transponders or portions of transponders on satellites must be suitable for the following modulations schemes and using aggregate data rates 56kbps – 5Mbps:

a) quadrature phase shift keying (QPSK) encoded transmissions,

b) 8 quadrature amplitude modulations (8-QAM),

c) 8 phase shift key (8-PSK),

d) 16 quadrature amplitude modulations (16-QAM),

e) Paired carrier multiple access modes.

C.5.2.8 All transponders must be non-preemptible.

C.5.2.9 All full transponders must be 36 MHz usable between guard bands

C.5.2.10 Fractional transponder allocations must be contiguous unless approved by the government

APPENDIX A

ASTI SITE INFORMATION

Antenna Types

Size (meters)	Manufacturer	Model	Ports	Polarization
3.6	Scientific Atlanta[1]	8136	2	Linear
3.8	Patriot	TXINT-380MOT-001/ TXINT-380AXHWMOT-EE-FAA	2	Linear
4.5	Scientific Atlanta	8345	2	Linear
6.1	Scientific Atlanta	8060	2	Linear
11.2	Scientific Atlanta	8016 (8007-2)	2, 3, or 4	Linear

([1] Now Viasat)

ASTI Site Location Information (All sites in Alaska, unless noted "[2]")

Site Name	FAA LID	Assocated Hub AFSS	Dual Satellite Access	Antenna Dia. (m) Radome(s)	Latitude	Longitude
ADAK	ADK	ENA	Y	6.1 radomes	51°52'15.52"N	176°40'28.27"W
AMBLER	AFM	FAI	N	4.5 radome	67°06'16.56"N	157°51'29.57"W
[2] ANADYER, RUSSIA	DYR	N/A	N	UKNOWN	58°40'48.00"N	203°21'00.00"W
ANCHORAGE	ZAN	N/A	Y	11	61°13'42.23"N	149°46'55.36"W
ANIAK	ANI	ENA	Y	3.6	61°35'6.62"N	159°35'44.52"W
ANNETTE	ANN	JNU	Y	3.6	55°3'6.38"N	131°34'51.98"W
BARROW	BRW	FAI	Y	4.5	71°16'57.17"N	156°47'32.35"W
BARTER ISL	BTI	FAI	Y	3.6	70°07'49.27"N	143°38'01.63"W
BETHEL	BET	ENA	Y	6.1	60°47'17.32" N	161°50'27.68"W
BETTLES	BTT	FAI	Y	3.6	66°54'17.82"N	151°32'09.18"W
BIG DELTA	BIG	FAI	Y	3.6	64°1'28.01"N	145°41'59.37"W
BIORKA IS / SITKA	BKA	JNU	Y	3.6	56°51'07.69"N	135°33'08.73"W
BUCKLAND	BVK	FAI	N	4.5 radome	65°58'40.22"N	161°08'43.05"W
CAPE LISBURNE	LUR	FAI	Y	4.5	68°52'7.84"N	166° 6'58.29"W
CAPE NEWENHAM	EHM	ENA	Y	3.8	58°38'16.47N	162°03'43.79W
CAPE ROMANZOF	CZF	ENA	Y	3.6 radomes	61°47'02.59"N	166°00'09.88"W
CAPE YAKATA	CYT	JNU	N	4.5 radome	60°04'58.27"N	142°29' 20.27W
COLD BAY	CDB	ENA	Y	4.5 radomes	55°14'31.77"N	162°46'1.69"W
CORDOVA	CDV	JNU	Y	3.6	60°29'38.57"N	145°28'18.38"W
DEADHORSE	SCC	FAI	Y	6.1	70°11'52.56"N	148°28'5.59"W
DILLINGHAM	DLG	ENA	Y	4.5	59°0'0.08"N	158°32'52.78"W
DUTCH HARBOR	DUT	ENA	Y	4.5 radomes	53°54'16.08"N	166°32'51.36"W
FAIRBANKS	FAI	ZAN	Y	11	64°48'37.07"N	147°50'46.78"W
FORT YUKON	FYU	FAI	Y	3.6	66°34'24.93"N	145°12'55.24"W
GALENA	GAL	FAI	Y	3.6	64°44'22.25"N	156°57'28.04"W

Site Name	FAA LID	Assocated Hub AFSS	Dual Satellite Access	Antenna Dia. (m) Radome(s)	Latitude	Longitude
GAMBELL	GAM	FAI	Y	3.6 radomes	63°46'54.76"N	171°44'10.50"W
GULKANA	GKN	ENA	Y	3.6	62° 9'13.52"N	145°26'50.74"W
GUSTAVUS	GST	JNU	Y	3.6	58°25'3.25"N	135°41'46.70"W
HOMER	HOM	ENA	Y	3.6	59°42'32.20"N	151°27'24.73"W
HOOPER BAY	HPB	ENA	N	4.5 radome	61°31'08.52"N	166o08'06.12"W
HUSLIA	HSL	FAI	N	4.5 radome	65o41'50.36"N	156o23'23.71"W
ILIAMNA	ILI	ENA	Y	3.6	59°44'50.79"N	154°54'36.54"W
INDIAN MTN	UTO	FAI	Y	4.5 radomes	66°4'21.92"N	153°41'17.97"W
JOHNSTONE POINT	JOH	JNU	Y	3.6	60°28'51.56"N	146°35'22.01"W
JUNEAU	JNU	ZAN	Y	11	58°21'44.50"N	134°35'12.15"W
KENAI	ENA	ZAN	Y	11	60°34'3.51"N	151°14'19.76"W
KING SALMON	AKN	ENA	Y	4.5	58°41'36.24"N	156°40'14.28"W
KOTZEBUE	OTZ	FAI	Y	4.5	66°53'14.64"N	162°36'37.60"W
LEVEL ISL	LVD	JNU	Y	3.6	56°28'17.18"N	133° 4'56.12"W
MCGRATH	MCG	ENA	Y	3.6	62°57'24.82"N	155°36'41.35W
MEKORYUK	MY'U	ENA	N	4.5 radome	60°22'26.76"N	166°14'2.84"W
MIDDLETON ISL	MDO	JNU	Y	3.6	59°26'50.33"N	146°19'7.04"W
NIKOLSKI	IKO	ENA	N	4.5 radome	52°56'24.13"N	168°51'33.01"W
NOME	OME	FAI	Y	3.6	64°29'39.40"n	165°19'1.08"W
NORTHWAY	ORT	FAI	Y	3.6	62°57'42.10"N	141°56'6.38"W
[2] OKLAHOMA CITY, OK	OKC	N/A	Y	TBD	35°23'40.83"N	97°37'23.67"W
PORT HEIDEN	PTH	ENA	Y	3.6	56°57'30.56"N	158°38'16.64"W
SAND POINT	SDP	ENA	Y	3.6	55°18'56.69"N	160°31'13.54"W
SAVOONGA	SVA	FAI	N	4.5 radome	63°41'19.97"N	170°29'29.46"W
[2] SEATTLE WA	ZSE	FAI/JNU	Y	6.1	61°13'42.23"N	149°46'55.36"W
SELAWIK	WLK	FAI	N	4.5 radome	66°35'59.44"N	159°59'47.08"W
SHEMYA	SYA	N/A	Y	4.5 radomes	52°43'27.97"N	174°08'20.08"E
SPARREVOHN	SVW	ENA	Y	3.8	61°06'20.77"N	155°36'27.45"W
ST. GEORGE	PBV	ENA	N	4.5 radome	56°35'42.60"N	169°42'42.64"W
ST. MARYS	KSM	ENA	Y	3.6	62° 3'28.76"N	163°16'46.95"W
ST. PAUL	SNP	ENA	Y	4.5 radomes	57°10'37.29"N	170°15'5.64"W
TALKEETNA	TKA	ENA	Y	3.6	62°17'56.87"N	150°6'16.13"W
TANANA	TAL	FAI	Y	3.6	65°10'23.04"N	152°6'32.92"W
TEST / TRAINING	TTF	N/A	Y	3.8, 3.6	61°13'42.23"N	149°46'55.36"W
TIN CITY	TNC	FAI	Y	3.6	65°33'49.12"N	167°58'10.11"W
TOGIAK	TOG	ENA	N	4.5 radome	59° 3'2.69"N	160°23'57.59"W
UNALAKLEET	UNK	FAI	Y	3.6	63°53'4.52"N	160°47'28.59"W
VALDEZ	VDZ	JNU	Y	3.6	61°7'58.52"N	146°13'30.87"W
WOODY ISLAND	ODK	ENA	Y	3.6	57°46'45.04"N	152°20'24.73"W
WRANGELL	WRG	JNU	N	4.5 radome	56°29'12.36"N	132°23'9.74"W

Site Name	FAA LID	Assocated Hub AFSS	Dual Satellite Access	Antenna Dia. (m) Radome(s)	Latitude	Longitude
YAKUTAT	YAK	JNU	Y	3.6	59°30'28.66"N	139°40'8.41"W